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| Project Name | Mexico-Renewable Energy for Agriculture |
| Region | Latin America and Caribbean Region |
| Sector | Environmentally and Socially Sustainable Development |
| Project ID | MXGE60718 |
| Recipient | Nacional Financiera, S.N.C. |
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Background

The World Bank Group Mexico Country Assistance Strategy (Report 19289-MX dated May 13, 1999) emphasizes a development agenda with three core themes: (i) social sustainability; (ii) removing obstacles to sustainable growth and maintaining macro-economic stability; and (iii) more effective public governance. The project would contribute directly to all three themes and is also directly consistent with the World Bank Group's strategy on the environment in Mexico, which prioritizes identification of "win-win" investment opportunities, where global environmental benefits and national economic benefits can be generated through an integrated and mainstreamed approach to development priorities". The social theme would be addressed by increasing the income of farmers and thereby improving the standard of living in rural areas. The growth theme, as well as its key element of protecting the environment, would be addressed by improving the productivity of farmers using environmentally-benign, least-cost renewable energy technologies. Finally, the public governance theme would be addressed by assisting the Government in its decentralization efforts and building the capacity of government agencies to provide farmers with technical assistance in the use of renewable energy technologies.

The project addresses issues in the agriculture and energy sectors.

Agriculture: Agriculture remains a weak sector of the Mexican economy but agriculture could remain an important economic sector provided a) its commercial sector continues to be competitive through the permanent use of modern technologies and increased yields and b) the productive potential of small-scale farming can be fully developed. Improving the delivery of financial services to the rural population remains one of the main constraints to the development of the agricultural sector. Financial services remain severely deficient in rural areas and access to financial resources for productive investment continues to be limited, especially for small farmers.

In 1996, the Government launched a national agriculture and rural development initiative - the Alianza para el Campo (Alianza) Program - to increase capitalization in the agriculture sector. The Program fosters agricultural

productivity improvement by financing productive investments (under a matching grant scheme) and by providing support services (research, extension, information and training) for a wide range of agricultural activities. In providing matching grants for the acquisition of capital equipment, Alianza essentially substitutes for absent rural finance services. The cornerstones of the Alianza program are its decentralized approach, with a delegation of administration and decision-making to the States, and its demand-driven nature, providing financing and support services only in response to requests from farmers.

The Government most recently developed the Agricultural Productivity Improvement Project (ALCAMPO) to support and improve Alianza's delivery of financing and technical services to small farmers and poor rural communities. A World Bank loan of US\$445 million was approved in December 1998 and project implementation began in early 1999.

Energy: Approximately 5 percent of Mexico's population remains without access to electricity, including an estimated 5 million people, 88,000 villages and 600,000 livestock farms. While government at all levels recognize the productivity and social development benefits of rural electrification, and especially of the electrification of farms, budget limitations and rural poverty will prevent the electrification of the vast majority of these energy users in the foreseeable future.

In 1994, Mexico began to support the electrification of farms with renewable energy in 8 of the country's 32 states through FIRCO's participation in the USAID/USDOE-supported Renewable Energy Program. The experience gained by FIRCO through this program has enabled the government to expand the scope of Alianza to cover the electrification of farms with renewable energy systems. Farmers can now receive matching grants from Alianza towards the purchase of renewable energy systems to pump water and power farm equipment. Further, farmers can receive proportionately larger grants for renewable energy systems than for conventional energy equipment. However, a number of barriers have been encountered in the implementation of this program, which have impeded the development of a self-sustaining market in farm-based renewable energy systems.

The barriers impeding penetration of renewable energy technologies in Mexico's agriculture sector include: (i) lack of awareness among unelectrified farmers regarding renewable energy technologies; (ii) lack of trained technicians and vendors that can design, install and service renewable energy systems and agricultural extensionists that can advise farmers on their proper operation; (iii) lack of technical specifications and certification processes for renewable energy equipment; (iv) uncertainty within the local renewable energy industry regarding the potential market for renewable energy systems in the agricultural sector and potential applications of renewable energy technologies on farms; (v) farmers' perception of renewable energy technologies as risky, simply because they are novel; and (vi) the high initial cost of renewable energy systems, relative to conventional alternatives, coupled with deficient rural finance services that prevent farmers from financing their higher initial cost over time.

Past performance and Issues

The project would address the identified barriers to the penetration of renewable energy technologies in Mexico's agriculture sector by a) implementing a nation-wide promotion campaign to increase farmers' awareness

of renewable energy systems; b) building the capacity of technicians and agricultural extensionists through training; c) introducing technical specifications and certification procedures for farm-based renewable energy equipment; d) carrying out studies on the potential market and applications for renewable energy in Mexico's agriculture sector; e) installing renewable energy systems (including solar- and wind-powered pumps and solar-powered refrigerated milk storage tanks) on selected farms as demonstration units to reduce other farmers' perceived risk; f) supporting the operation of these renewable energy systems through the provision of on-going technical assistance to participating farmers by trained extensionists; and g) testing innovative vendor financing mechanisms for farm-based renewable energy systems in four states.

One of the most important strategic choices adopted for the project is to implement it within the framework of the federal government's Alianza para el Campo Program. Alianza is an established and well-run program that covers the entire nation and enjoys substantial support among farmers and all levels of government. Its demand-driven and participatory approach to the provision of financial and technical assistance to farmers supports economic efficiency and local ownership. Alianza provides the project with an established vehicle with which to deliver renewable energy-focused financial and technical assistance to unelectrified farmers throughout the country. Another strategic choice is to experiment with vendor financing as an approach to the financing of farm-based renewable energy systems. Given the deficiency of consumer financing in rural areas, vendors of renewable energy systems represent an efficient conduit with which to deliver financing to farmers.

Project Description

a. Project development objective are:

- a) to provide unelectrified farmers with reliable electricity supply for productive purposes in a least-cost and sustainable manner using renewable energy technologies;
- b) to increase the productivity and income of unelectrified farmers by supporting the adoption of productive investments and improved farming practices; and
- c) to improve FIRCO's ability to catalyze the penetration of renewable energy technologies in the agriculture sector.

b. Project components and costs: TABLE AVAILABLE IN THE INFOSHOP

Project implementation

Project implementation would span a 4 year period (2000-2003). The project would be executed by the Trust Fund for Shared Risk (FIRCO), a parastatal agency operating under the Secretariat of Agriculture, Livestock and Rural Development (SAGAR), the main Mexican counterpart to the USAID/USDOE Renewable Energy Program.

FIRCO would establish a Project Coordination Office (PCO) in its Mexico City headquarters to execute the project and use its state offices to coordinate local project activities. The PCO would directly manage execution of the promotion, institutional strengthening, market development and specifications and certification components, with support from FIRCO's state offices. The demonstration, technical assistance and vendor financing components would be

delegated to the state offices, which would receive support from the PCO. The state offices would implement the demonstration and technical assistance components by integrating renewable energy and GEF support into their ongoing implementation of the above-mentioned Alianza sub-programs. The vendor financing pilot program would be implemented in the four target states by the FIRCO offices in those states.

Project Sustainability

The project aims to remove barriers to the use of renewable energy in the agriculture sector. The prospects for sustainability of barrier removal are as follows:

- Lack of awareness among farmers, lack of information on the renewable energy market and viable applications in agriculture and lack of specifications and certification should be permanently removed by project activities.
- Farmers' perceived risks with respect to renewable energy: The project's demonstration component should go a long way towards removing this barrier permanently. Seeing is believing in most rural areas and witnessing the successful operation of demonstration units will convince many farmers that renewable energy systems are reliable and cost-effective.
- Lack of renewable energy-trained technicians and extensionists: Technicians and extensionists trained under the program would maintain their knowledge base through their work installing renewable energy systems and advising farmers on their proper operation.
- Higher initial cost of renewable energy systems, coupled with deficient rural finance services: The recently announced incremental government support for renewable energy systems will help to diminish this barrier. In addition, vendor financing, to be tested in the project's vendor financing pilot, could also contribute to removing this barrier.

Sustainability of project benefits is expected to be high, given that the investments in renewable energy systems would be complemented by technical assistance to ensure their proper operation. In addition, increases in net income as a result of the renewable energy equipment will support improved maintenance of that equipment over time and further investments in productivity-improving equipment.

Lessons Learned from Past Operations

Flexibility and demand-driven approaches are key to building ownership, defining local priorities and facilitating improved implementation and sustainability of rural and agricultural development initiatives. Through its incorporation in the Alianza program, the project adopts a flexible and demand-driven approach to the provision of financial and technical assistance for renewable energy systems.

Micro-investment programs risk forming a disparate collection of interventions that may not catalyze the critical mass of activities to attract the private sector, generate competition among suppliers and foster the establishment of support services. Through strategic marketing, the project will aim to install an average of 34 renewable energy demonstration systems in each participating state, thus catalyzing local markets for solar pumps and regional markets for wind pumps and solar tanks.

It is important that investments in new technologies or practices be accompanied by technical assistance in their operation. In relation to this,

the project will make renewable energy-trained extensionists available to participating farmers in order to ensure the satisfactory operation of newly acquired renewable energy systems.

FIRCO's decentralized structure and ALCAMPO's supported Alianza's agile mechanisms should counter poor timing and lengthy budgetary and bureaucratic processes are likely to jeopardize the implementation of rural development programs, particularly in agriculture where natural cycles impose time constraints.

Developmental considerations, rather than technology or environmental considerations, should dominate any initiative to penetrate agricultural markets with new, environmentally-benign technologies, since farmers are primarily interested in productivity and income gains than new technology or environmental benefits. By setting the project within the auspices of the Alianza program, developmental considerations will dominate the project.

Program Objective Category: Environmentally Sustainable Development

Environmental Aspects

The project is classified as category B. The solar and wind technologies whose agricultural applications are to be demonstrated through the project are considered to be among the most environment-friendly forms of energy. Environmental benefits at the global level will be reduction in emission of greenhouse gases; and at the local level, abatement of air, water and soil pollution through substitution of gasoline-powered equipment. All potential negative environmental impacts associated with the use of renewable energy systems to increase agricultural productivity will be addressed through the environmental procedures established in the project Implementation Manual. This manual replicates the environmental procedures from the ALCAMPO manual, which apply regardless of the source of energy, with additions covering one aspect (battery disposal) which is specific to certain uses of solar energy.

In order to avoid more general environmental impacts associated with on-farm investment projects, the project would employ the same environmental procedures as required by ALCAMPO.

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Note: This is information on an evolving project. Certain activities and/or components may not be included in the final

project.

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